DOCUMENT RESUME

ED 352 628 CS 011 126

AUTHOR Horney, Mark
TITLE Data Maps: A Hypertext Technique for Visualizing, Analyzing and Presenting Qualitative Data.
PUB DATE Dec 92
NOTE 14p.; Paper presented at the Annual Meeting of the National Reading Conference (42nd, San Antonio, TX, December 2-5, 1992).
PUB TYPE Speeches/Conference Papers (150) -- Guides - Non-Classroom Use (055)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Data Analysis; *Editing; Higher Education; *Hypermedia; Information Sources; *Qualitative Research; Research Methodology; Research Tools
IDENTIFIERS *Data Maps; Discourse Communities; EntryWay; Text Design; Text Organization

ABSTRACT

Making diagrams of the relationships among data is not a new idea: however, the utility of computerized hypertext techniques makes the task more feasible, on a wider scale of data. Data maps using "EntryWay" (a hypertext editing program) were made based on qualitative data from eight different research projects, including: a discourse analysis of 100 postings on an electronic bulletin board; transcripts of interviews with students; transcripts of lessons for preservice teachers on the nature of learning in music classes; transcripts of videotapes of mathematics lessons, and observation notes of preschool children at play. From the eight studies, four specific uses for data maps emerged: (1) as navigational aids; (2) as prompts for further investigation; (3) as demonstrations of relationships; and (4) as cognitive supports. Data maps add a new tool for researchers in the visualization, analysis, and display of their data. (Fifteen figures representing data maps are included.) (RS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED352628

Data Maps: A Hypertext Technique for Visualizing, Analyzing and Presenting Qualitative Data

by

Mark Horney
215 Education
School of Education
University of Oregon
Eugene, Oregon 97403
Internet: mhorney@oregon.uoregon.edu

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Mark A. Horney
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Presented at the National Reading Research Conference
December 2-5, 1992
San Antonio, Texas

CS011126

BEST COPY AVAILABLE

Data Maps: A Hypertext Technique for Visualizing, Analyzing and Presenting Qualitative Data

Mark Horney
University of Oregon

Figure 1 shows a data map. This data map was created with a hypertext editing program called *EntryWay*.

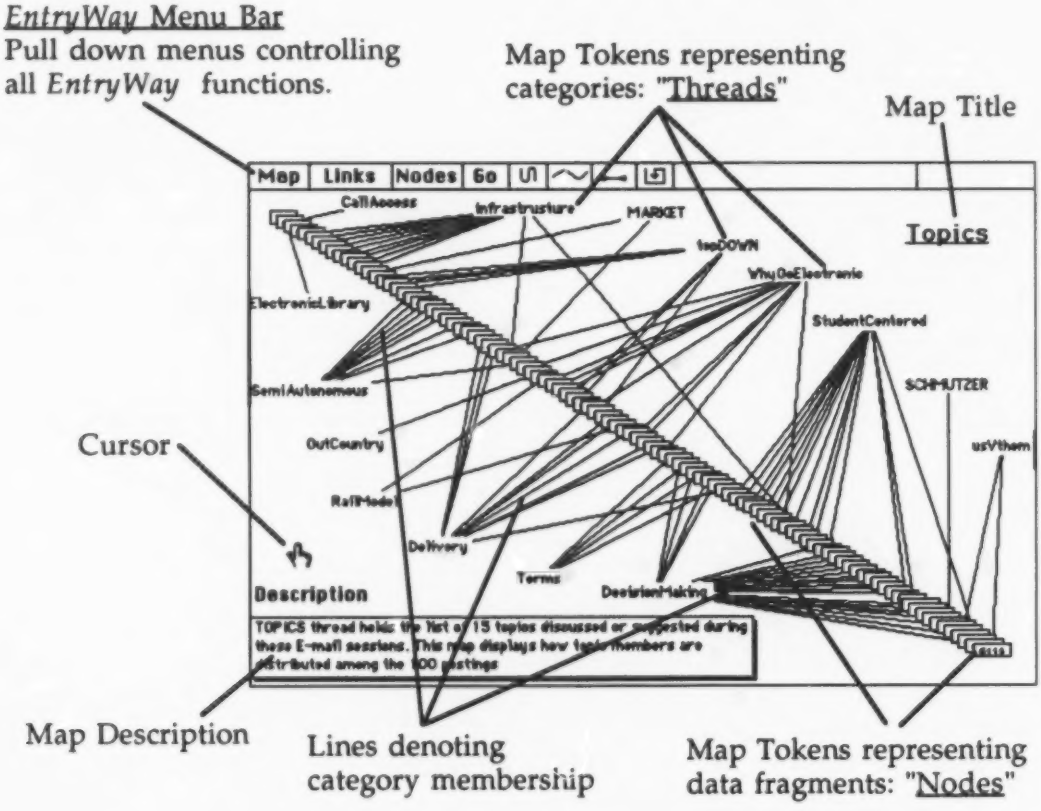

Figure 1. Topics Data Map taken from *E-Mail*

Hypertext documents are written and read using a computer and have three salient characteristics distinguishing them from standard, printed documents:

- The content of a hypertext document is segmented into discrete elements called "nodes." Nodes can be very small, consisting of only a single word, or very large, with many pages of text, or even a whole book. Nodes can contain graphics, diagrams, pictures, and even video clips, as well as text.

- Hypertext nodes are "linked" together by a variety of mechanisms. These links can be used to form nodes into semantic networks, or for categorization.

- Hypertext readers and authors "navigate" from node to node by following links.

The map in Figure 1 shows categorical relationships among 100 messages posted on an electronic bulletin board. The messages form a discussion about policy issues among 16 members of a university faculty. For this map, the messages were categorized by topics. This map is part of a hypertext document, called E-MAIL, created as part of a discourse analysis of electronic communications.[1] E-MAIL contains 100 nodes, each containing one electronic message such as the one shown in Figure 2:

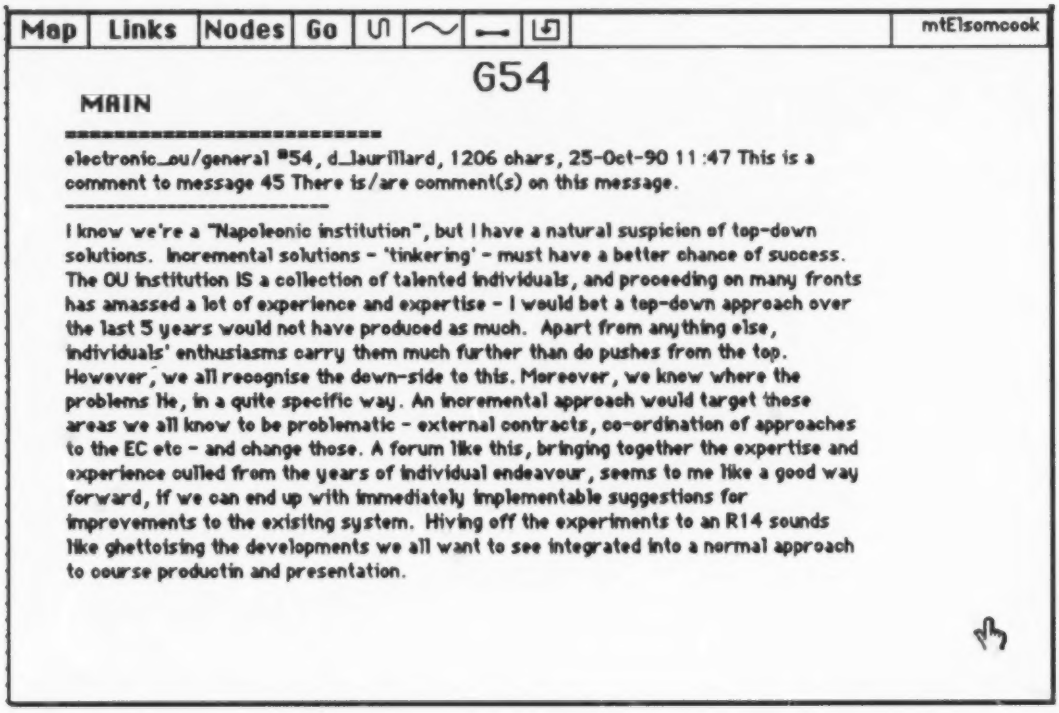
Map
Links
Nodes
Go
mtElsomcook
G54
MAIN
electronic_ou/general #54, d_laurillard, 1206 chars, 25-Oct-90 11:47 This is a comment to message 45 There is/are comment(s) on this message.
I know we're a "Napoleonic institution", but I have a natural suspicion of top-down solutions. Incremental solutions - 'tinkering' - must have a better chance of success. The OU institution IS a collection of talented individuals, and proceeding on many fronts has amassed a lot of experience and expertise - I would bet a top-down approach over the last 5 years would not have produced as much. Apart from anything else, individuals' enthusiasms carry them much further than do pushes from the top. However, we all recognise the down-side to this. Moreover, we know where the problems lie, in a quite specific way. An incremental approach would target these areas we all know to be problematic - external contracts, co-ordination of approaches to the EC etc - and change those. A forum like this, bringing together the expertise and experience culled from the years of individual endeavour, seems to me like a good way forward, if we can end up with immediately implementable suggestions for improvements to the exisitng system. Hiving off the experiments to an R14 sounds like ghettoising the developments we all want to see integrated into a normal approach to course productin and presentation.

Figure 2. E-MAIL Message Node

In addition, E-MAIL contains nodes representing a variety of categories, such as those shown on the map in Figure 1, which is itself an E-MAIL node. On the map, nodes are represented by "tokens." In this map the 100 messages are represented by the boxes down the diagonal and the topic categories by the words around the map edges (In *EntryWay* nomenclature such categorical nodes are called "Threads," as in "the thread of an

[1] More information about *EntryWay* and its use for qualitative research can be found in "Supporting Multiple Perspectives: Case Studies of Using Hypertext in Qualitative Research" (Horney, 1992), which can be found in the *Proceedings of the Qualitative Research in Education Conference*, Athens, Georgia, January 2-5, 1992.

argument") The lines drawn from the categories to the messages show which messages belong to which categories. Other maps taken from E-MAIL are shown in Figures 3-6:

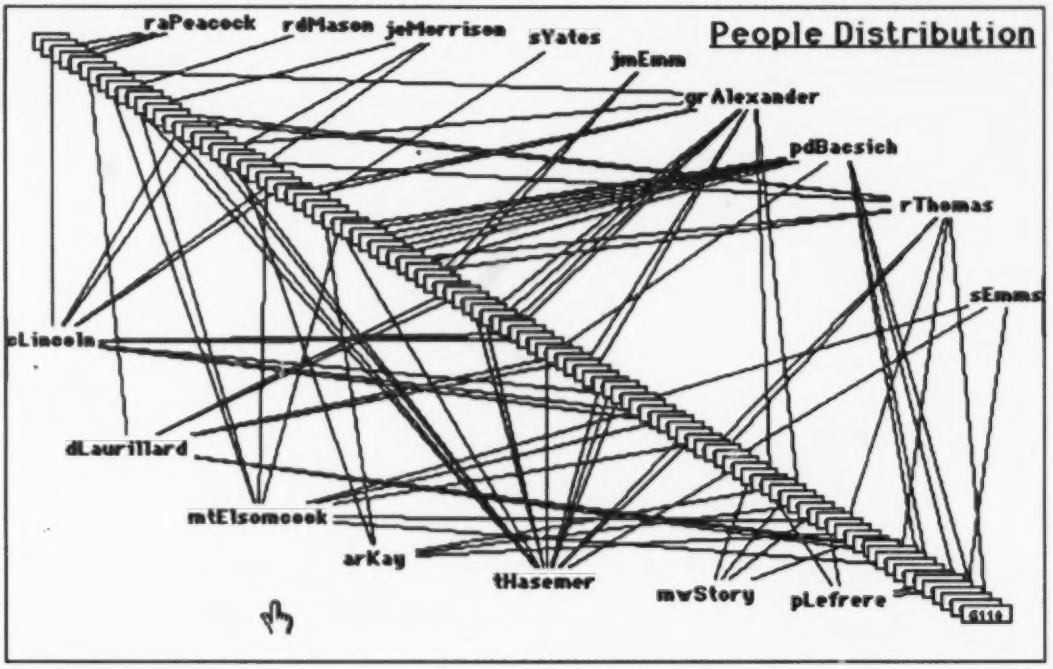

Figure 3. Distribution of Individual Posting to E-MAIL

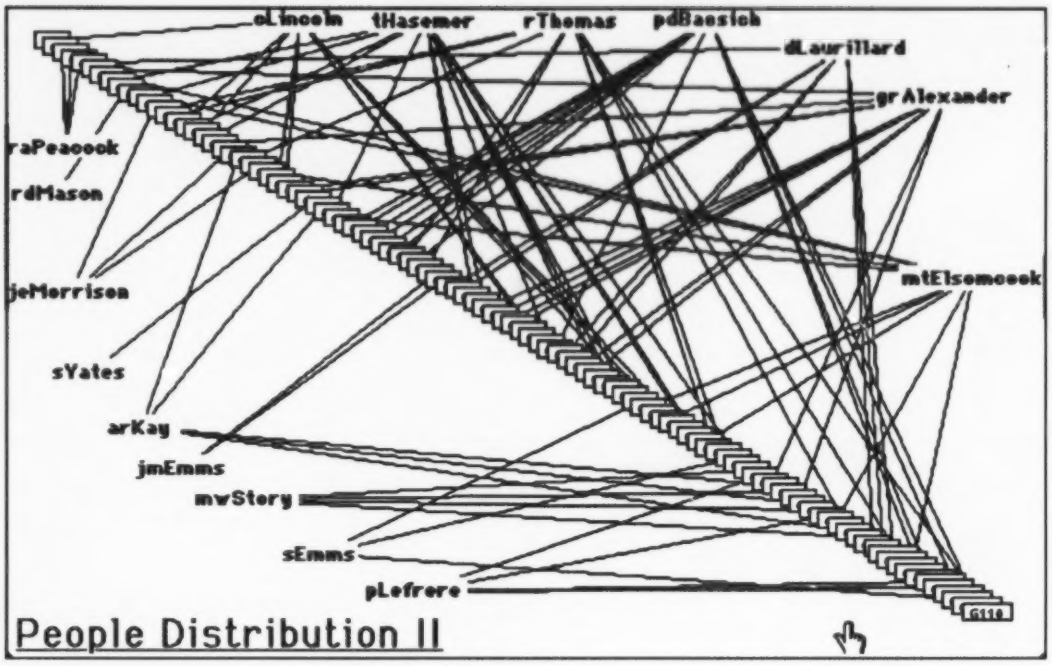

Figure 4. Version 2 of Individual Contributions to E-MAIL

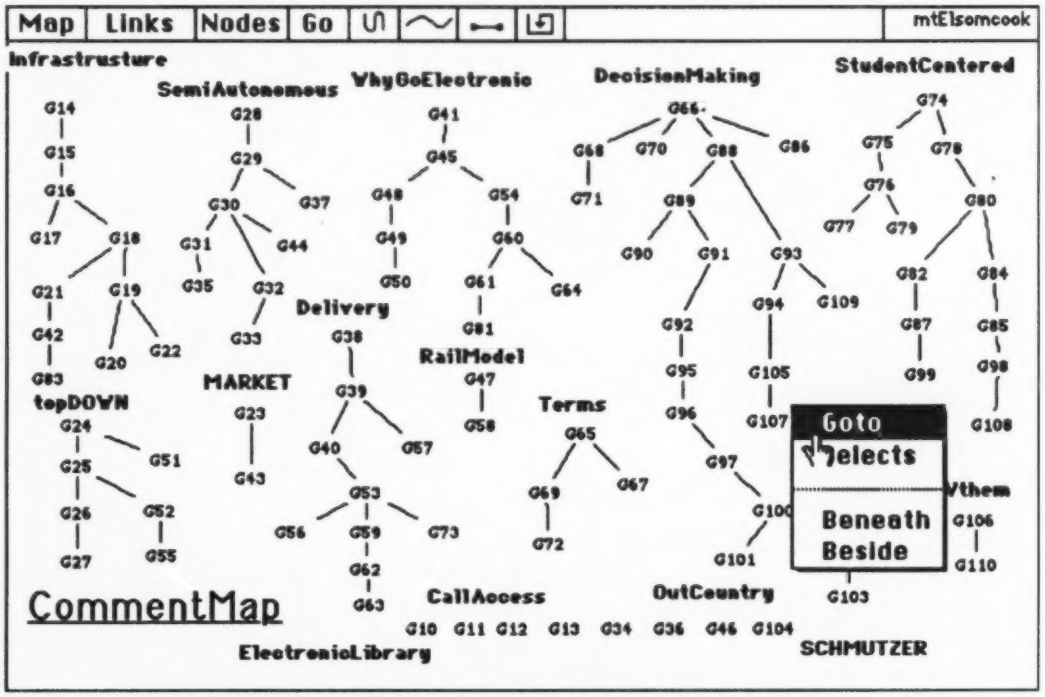

Figure 6. Map of Reply Relationships From E-MAIL

The Comment Map shown in Figure 5 is somewhat different than the others. Here the 100 messages, labeled G10 to G110, are related one to another by "binary links" rather than categorical associations. Binary links represent semantic relationships. In this case the links show how the messages were entered as replies to one another. For instance, the cluster of nodes in the upper left corner are the nodes of the "Infrastructure" thread. This topic was initiated in message G14. Message G15 was entered as a reply to G14, and was in turn commented upon by message G16. There were two replies to G16, and so on. This map thus shows the message reply structure of each conversational topic.

Examples of Data Maps

To date, seven different educational researchers and graduate students have made data maps using *EntryWay*. Examples of these maps are found below following a brief description of the associated research projects and hypertext documents.

E-MAIL	Discourse analysis of 100 postings to an electronic bulletin board. Messages entered by university faculty members discussing policy issues. Analysis targeted on examining the characteristics of computer-mediated communication among teachers and students involved in Distance Learning
RETELL	Transcript of interview with two student, Clint and Sue. Students are responding to questions regarding the plot, setting, and characters a short story read in electronic form. Transcript analyzed for reading comprehension.
ASSESSMENT	Transcripts of 22 students reflecting on their first experience as clinical speech pathologists. Transcripts analyzed to show student pre-dispositions towards positivist and constructionist teaching styles.
CONCEPTS	Transcript of lesson for pre-service teachers on the nature of learning in music classes. Transcript analyzed to illustrate concept development.
COLLOQUIUM	Transcripts interviews with eight teachers on the topic of mid-life changes. Transcript elements categorized according to teacher needs, administrative perceptions, and coping mechanisms.
GEOFF	Transcript of interview with gifted student. Transcript elements categorized on the student's likes, dislikes, strengths, and weaknesses in various content areas in preparation of an Individualized Educational Program (IEP).
MATH LESSONS	Transcripts of video tapes of two mathematics lessons. Transcript elements categorized by lesson content, activity type, and questioning strategies used by the instructor. Analysis directed toward identifying relationships between questioning techniques and activity structures.
PLAY	Observation notes of pre-school children at play in a day care facility. Analysis focused on the development of spontaneous collaboration in a self-directed play context.

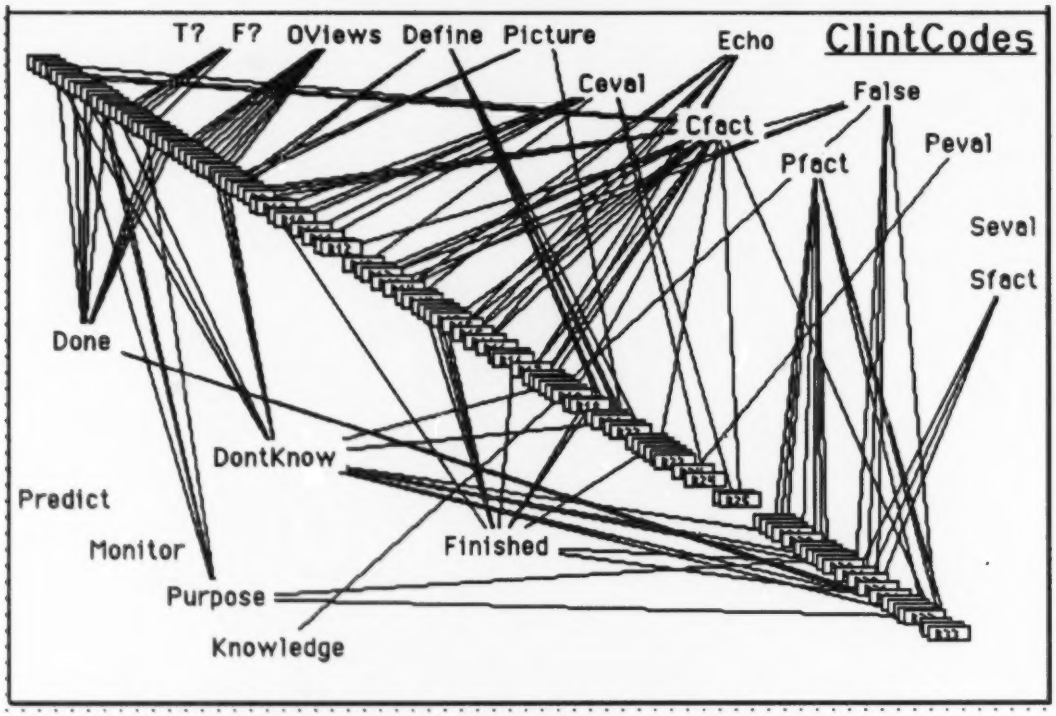

Figure 6. Coding of Clint Nodes from RETELL

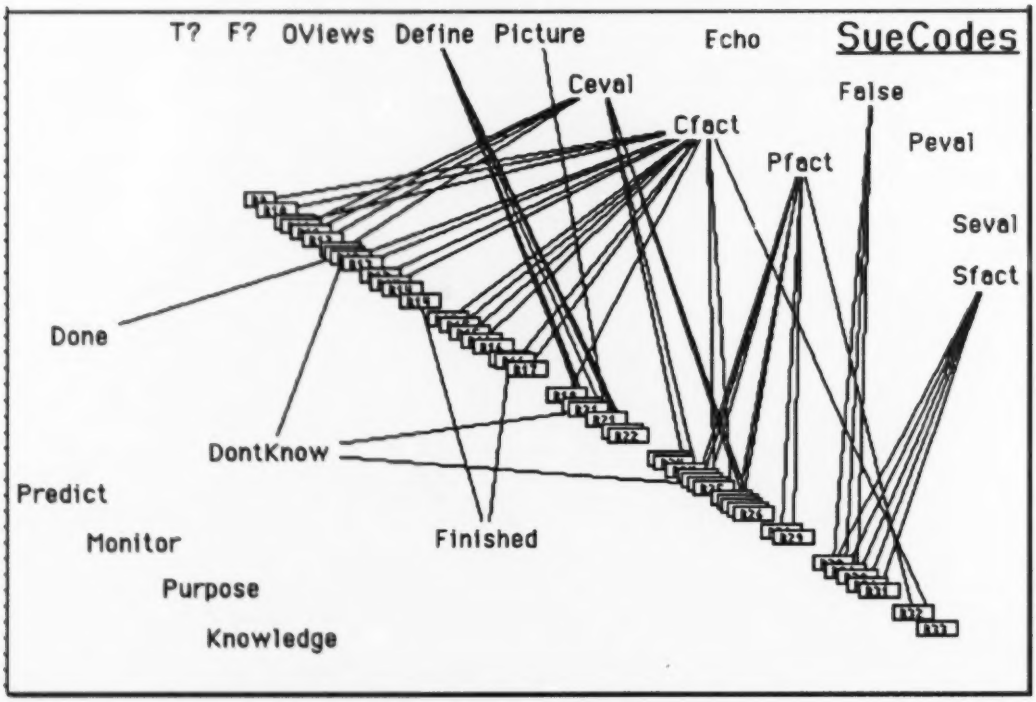

Figure 7. Coding of Sue Nodes from RETELL

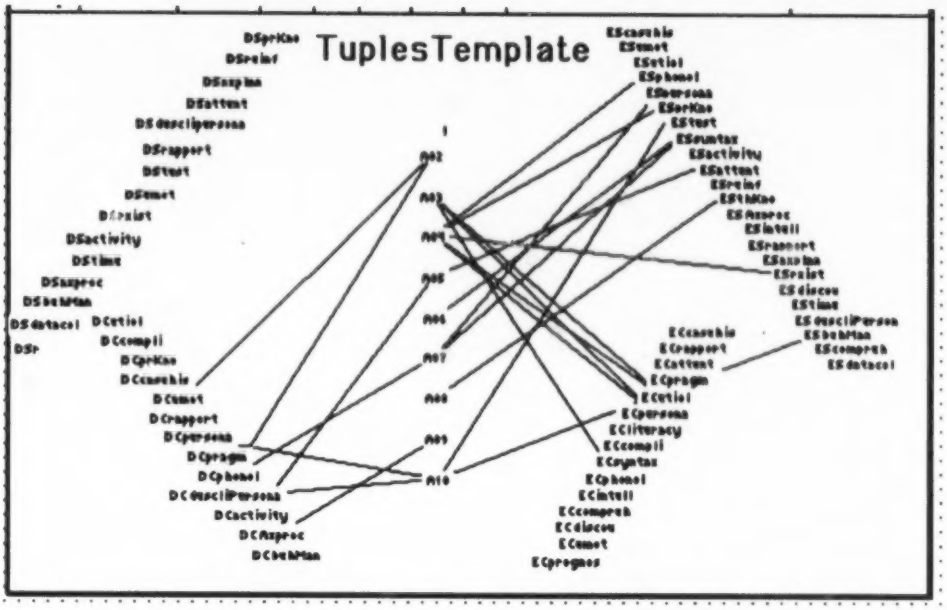

Figure 8. All Coding Categories From ASSESSMENT

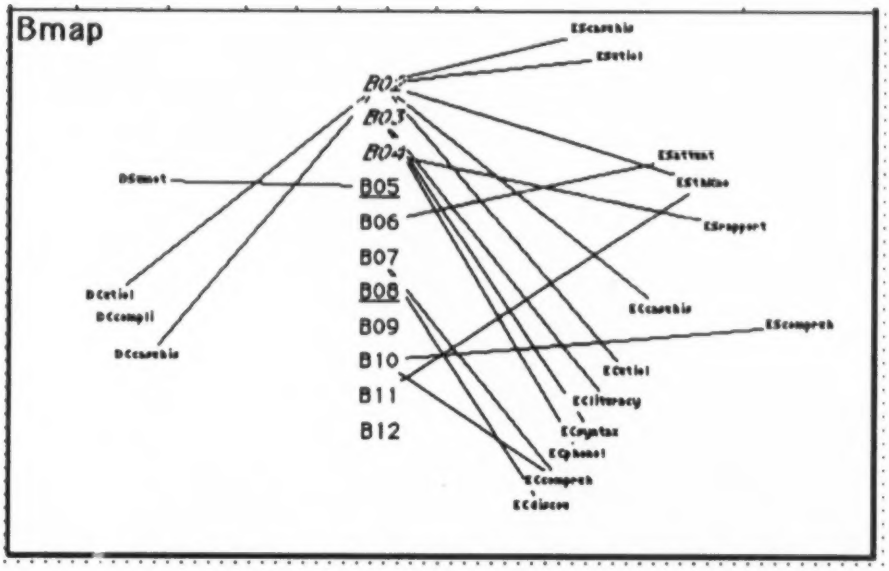

Figure 9. Coding for Subject "B" From ASSESSMENT

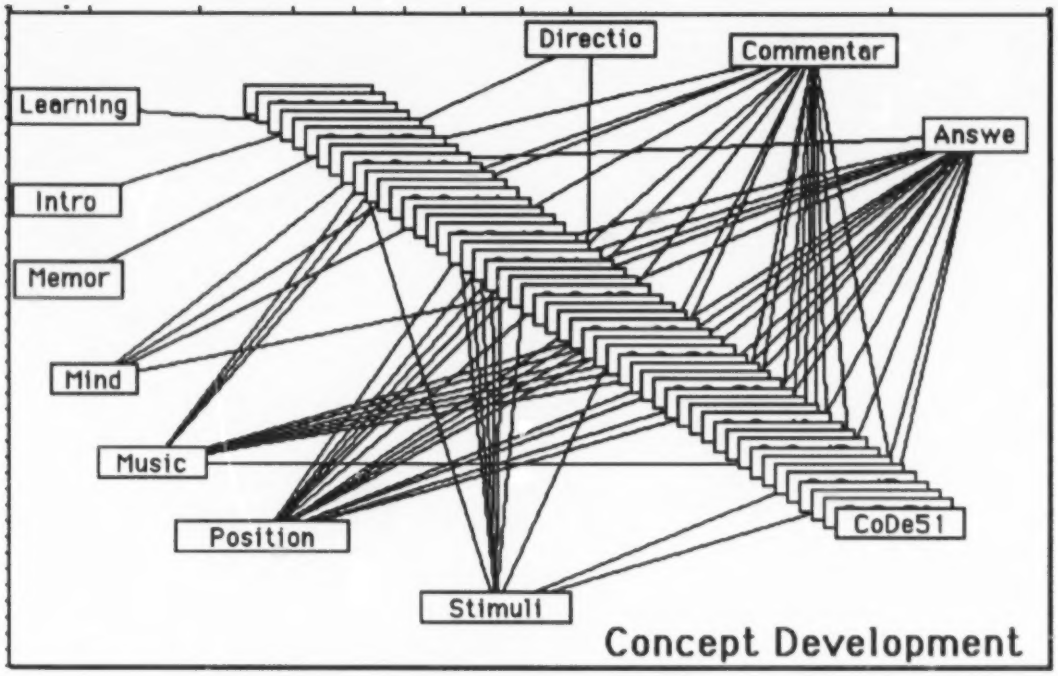

Figure 10. All Coding of Transcript from CONCEPTS

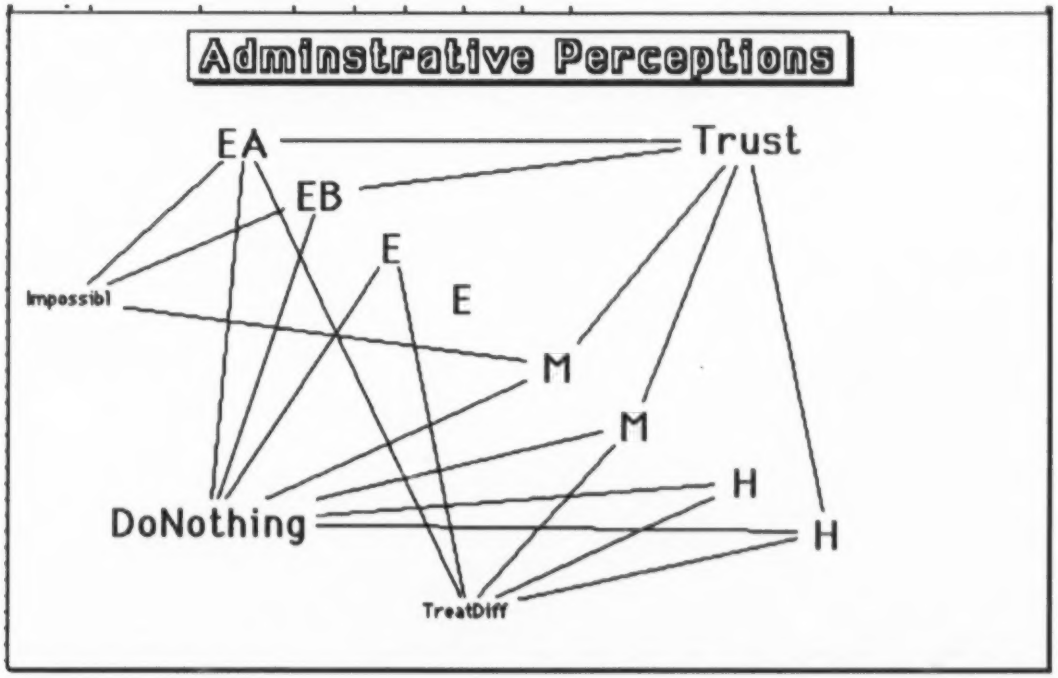

Figure 11. Coding for Administrative Perceptions from COLLOQUIUM

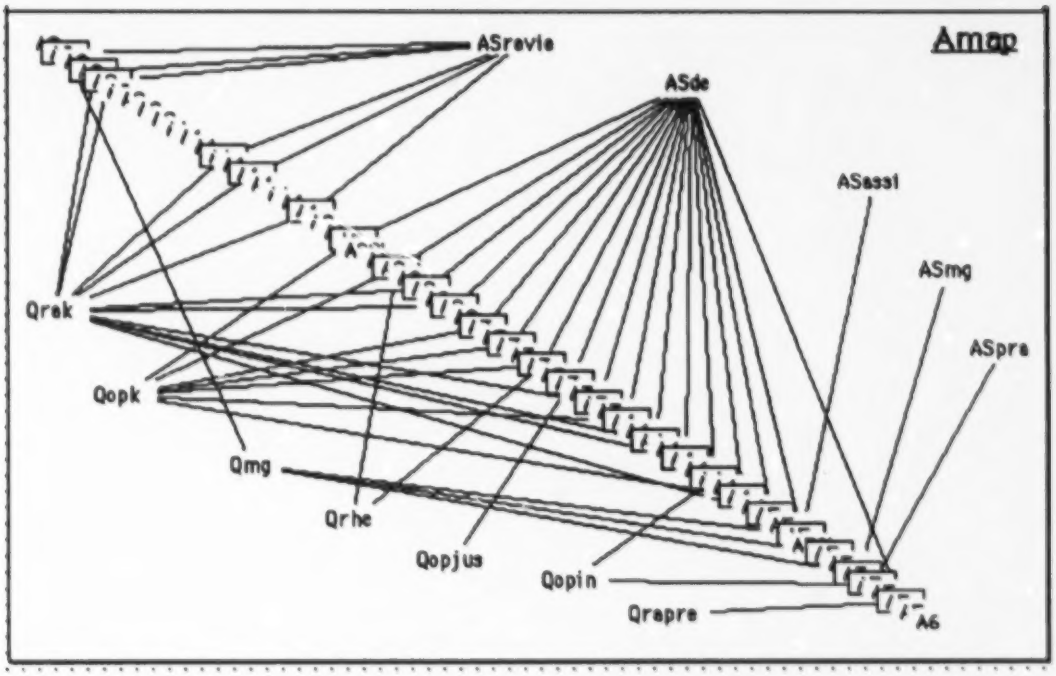

Figure 12. Questions vs Activity Structures of Lesson A from LESSONS

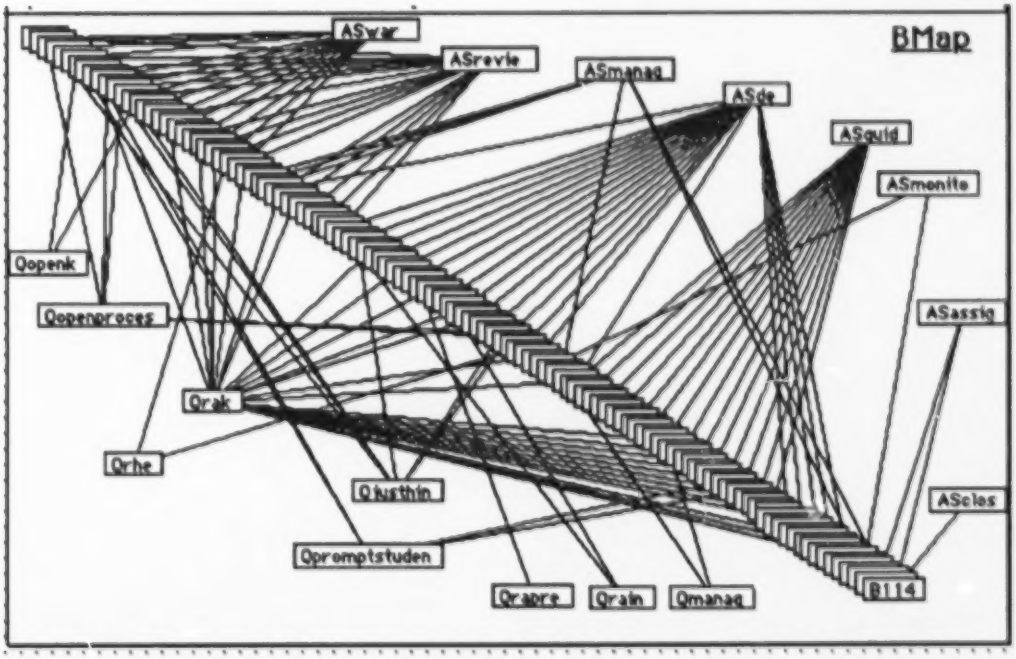

Figure 13. Questions vs Activity Structures of Lesson B from LESSONS

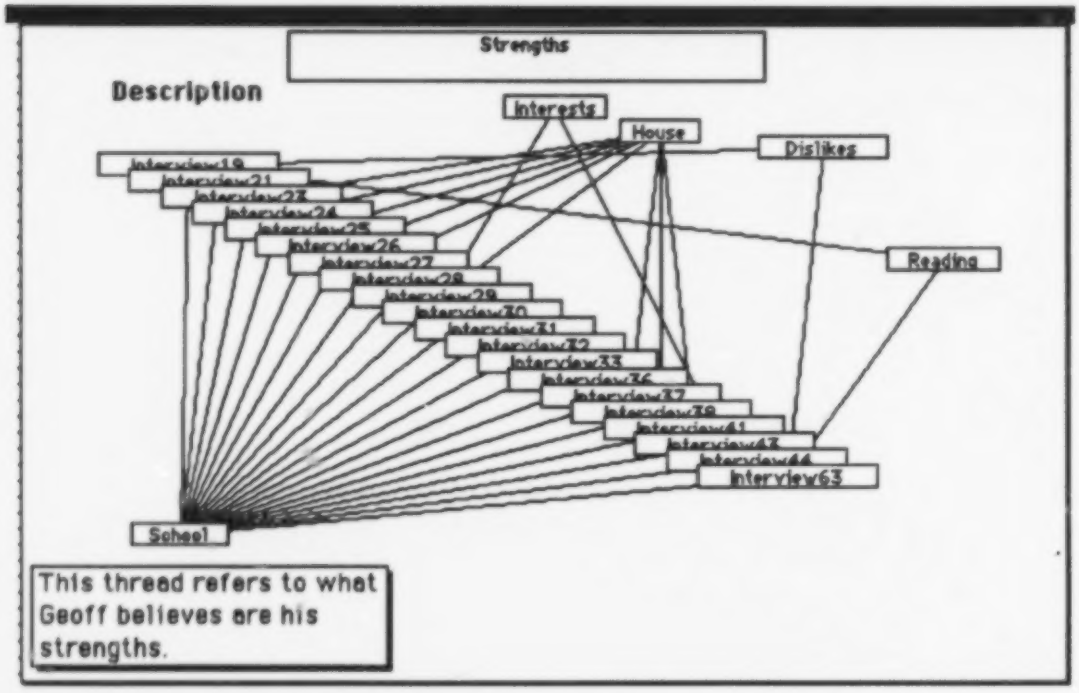

Figure 14. Coding of Strengths from GEOFF

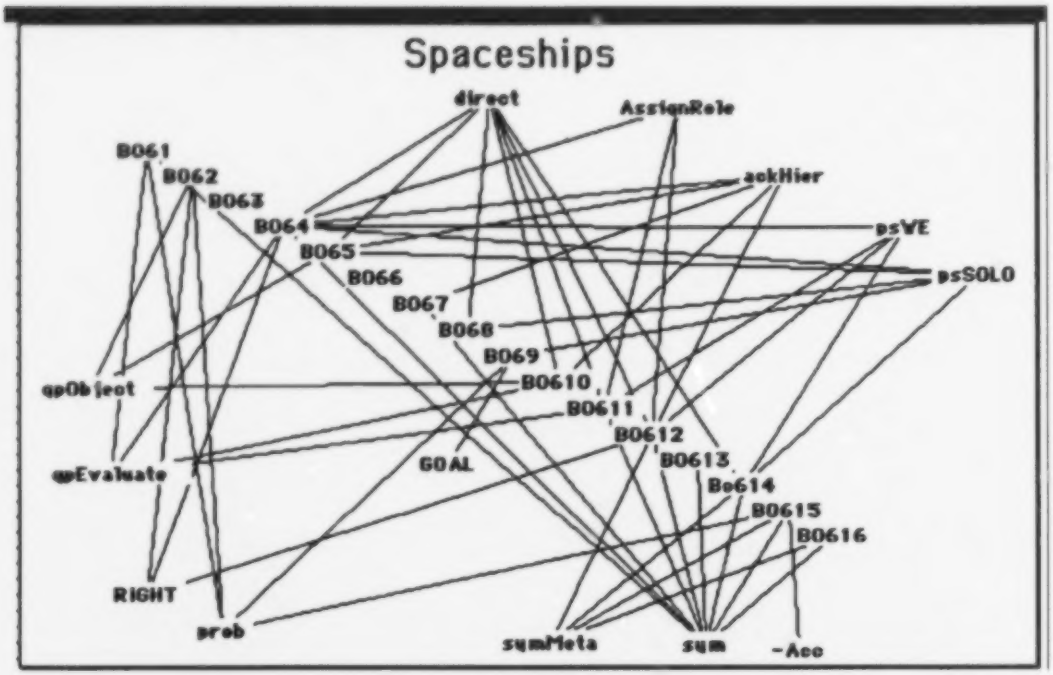

Figure 15. Coding of "Spaceship" Episode from PLAY

Uses of Data Maps

From these eight studies four specific uses for data maps have emerged:

- As navigational aids
- To prompts to further investigation
- To demonstrations of relationships
- As cognitive supports

Figure 5 captures a map in use as a navigational aid. A reader is shown selecting the "GOTO" option from a menu which appears whenever a map token is clicked by the cursor. In this way, researchers can move about their data, finding and reading relevant data. If a print out of the data nodes is made that includes the node titles, then maps can also assist manual forms information retrieval.

Data maps create a visual image of categorical relationships that might otherwise go unnoticed. For instance Figure 11 suggests a contradiction in teachers ideas about their administrators. The coding represented on this map show teachers making many negative comments about school administrators (categories "Impossible," "DoNothing," and "TreatDiff"), but yet also report trusting administrators. This clue about teacher attitudes was overlooked until made explicit by the map. Similarly, after looking at Figure 13, the researcher realized that her two categories ASwar(mup), and ASrevie(w), were so close in their definitions, as actually used during coding, that they should be merged. Maps can also point out areas where data analysis might need to be re-conceptualized. For example, after looking at the 22 maps like those shown in Figures 8 and 9, the researcher realized that her basic coding strategy was not extracting the information she expected and instead pointed to a different set of categories. In these ways data maps lead researchers into deeper and alternative investigations of their data. Some maps can serve as demonstrations of particular points researchers wish to make about their data. The maps in Figures 12 and 13 were used to demonstrate that this math teacher was well organized (i.e. classroom activities succeeded one another in an orderly pattern, with few entanglements caused by moving back and forth between different types of activity) and ask a wide variety of questions throughout all phases of the lesson. Figures 6 and 7 demonstrate the differences between two students' reaction to a story. Clint was frustrated by the assignment and repeatedly during the interview stated that he was "Done" with the reading assignment, even though he responded "Don't Know" to most questions about the story, and frequently asked if the interview was "Finished." Sue, on the other hand, was able to supply a wide variety information about what she had read.

The last use for data maps is encapsulated in the aphorism "Making a map is better than having a map." It appears that map making gives researchers the opportunity to quietly consider their data as they add and remove nodes, move tokens from place to place, draw and erase link and inclusion lines, and by literally untangling relationships during the creation of coherent displays. The result of this contemplation maybe new insights into the data and its implications.

Making diagrams of the relationships among data is not a new idea. However, the utility of computerized hypertext techniques make the task more feasible, on a wider scale of data. This adds a new tool for researchers in the visualization, analysis and display of their data.